



## OPINION

on dissertation work for obtaining the educational and scientific degree "**Doctor**" in: field of higher education 6. Agrarian sciences and veterinary medicine, professional field: 6.1 "Crop production", scientific specialty: "Crop production"

**Author of the dissertation:** Bozhidar Frantsov Tanchev, full-time PhD student at the Department of "Crop Production" at the Agricultural University, Plovdiv.

**Topic of the dissertation:** Responses of Bulgarian sunflower hybrids (*Helianthus annuus* L.) to contrasting agroecological conditions.

**Reviewer:** Assoc.Prof. Dr Zhivko Mihaylov Todorov, Agricultural University - Plovdiv, department of "Crop production" a field of higher education 6. Agricultural sciences and veterinary medicine professional field 6.1 "Crop production", scientific specialty "Crop production", appointed from the Rector of the Agricultural university, as a member of the Scientific Jury with Order No. RD-16-476 / 02.04.2026.

### 1. Relevance of the problem.

Sunflower (*Helianthus annuus* L.) is one of the four most important oilseed crops in the world. In our country, it occupies the largest area. The main factors determining the productivity and quality of its production are the choice of hybrid combined with the specific agro-ecological conditions. Over the past 20 years, there has been a trend towards the gradual introduction of foreign sunflower hybrids in our country, as a result of which its varietal composition is currently represented entirely by them. Despite the great successes of Bulgarian selection, the long-term cultivation of foreign hybrids leads to their neglect. The observed climate changes on the planet greatly increase the tendency of these hybrids to adapt more difficultly to our soil and climatic conditions and to exhibit their optimal productivity and quality to a lesser degree. This increasingly strengthens the interest of Bulgarian producers in the return of sunflower hybrids bred in our country.

That is why this dissertation presents results from an in-depth scientific and applied study of the reactions of Bulgarian sunflower hybrids to contrasting agro-ecological conditions.

In this regard, the topic of the dissertation is not only relevant, but also has significant theoretical and practical applicability.

### 2. Purpose, tasks, hypotheses and and methods of research.

The aim of the study is to establish the influence of different agro-ecological conditions on some biological and economic qualities of Bulgarian sunflower hybrids. It is formulated precisely and clearly, corresponding to the proposed title and predetermining the direction of the scientific work. To achieve this goal, five tasks have been set, and for their implementation during the period from 2023 to 2025, two parallel field experiments have been set, one in the Plovdiv agro-ecological region, and the other in the Dobrich agro-ecological region, General Toshevo municipality. The experiments were set up methodologically correctly, using the block method in 4 repetitions with a size of the experimental area of 28 m<sup>2</sup>, with five Bulgarian sunflower hybrids and one control. A detailed soil-climatic characteristic of the regions where the experiment was conducted

during the years of study has been made. The methods of work, the agrotechnics of the experiment and the methods of statistical data processing are described in detail.

### **3. Visualization and presentation of the results obtained.**

The dissertation submitted to me for review covers 162 pages and includes 9 main sections, which in terms of volume, structure and balance between the individual parts fully meet the requirements for awarding the educational and scientific Doctor degree. The results obtained are summarized and very well illustrated, through 26 tables, 27 figures and 1 appendix, which shows the ability of the doctoral student to systematize scientific information.

### **5. Discussion of the results and literature used.**

A comprehensive and in-depth literature review on the topic has been made, indicating the views of a number of domestic and foreign researchers on the problem under consideration. The literature review is presented on 18 pages, and includes 14 sources in Cyrillic and 153 in Latin, which shows a very good awareness of the doctoral student regarding the achievements in this field. This enables him to correctly and objectively interpret the results obtained.

The section "Results and Discussion" covers 84 pages out of a total of 162, which is 52% of the total volume of the dissertation. Extensive experimental material obtained from the field experiments is presented, combined with appropriate statistical analyses and modern statistical programs. A number of biological indicators have been monitored, and the main phenological phases have been registered, a significant number of biometric indicators have been recorded, the most important productive indicators have been calculated, and chemical analyses related to the quality of the products obtained and the composition of the soil have been carried out. Based on the experimental work performed, a thorough and precise discussion and analysis of the results, 13 conclusions were made that objectively reflect the results obtained.

The developed dissertation shows that the doctoral student can conduct field experimental work, correctly interpret the obtained data and compare what has been achieved in this area with results of other authors.

### **5. Contributions of the dissertation work.**

Based on the results obtained, the following scientific-theoretical and scientific-applied contributions have been formulated.

#### **Scientific and theoretical contributions**

1. It has been established that the growing season of sunflowers in the Plovdiv region is shorter than that in Dobrich by an average of 15 days, except in cases where there is a decrease in temperatures after sowing and prolonged germination, which prolongs the growing season.

2. The proportion of plant organs has been determined. The proportion of stems and pistils is greater in the Plovdiv region, and in the Dobrich region –that of leaves and seeds.

3. The study distinguished the Enigma hybrid as the most stable. The Dalena hybrid ranked second, Sunny third, Deveda fourth, and in last place as the most unstable in terms of yield were the P64LP170 and Krasela hybrids.

4. A positive correlation was found between seed yield and oil yield, mass and number of seeds in the kernel. A positive correlation was found between oil content and test weight, and a negative correlation was found between oil content and crude protein content.

#### **Scientific and applied contributions**

1. The combination of climatic conditions in the individual regions is specific and allows for differentiation of the tested hybrids at 33 different levels of abiotic stress during the individual phenological phases. The accumulated information is suitable for refining the cultivation technology under the conditions of Southern and Northern Bulgaria in a risky environment.

2. It has been studied that in the region of Southern Bulgaria the highest seed yields were recorded for the Sunny hybrid, and in Dobrudzha for the P64LP170 standard. In the region of Dobrich the most oil was obtained from the Deveda hybrid, and in Plovdiv – from the Sunny hybrid. In both regions the highest meal yield was obtained from the P 64 PL 170 standard.

3. It was found that the highest oil content in both regions is recorded by the Sunny hybrid, which also achieved the highest mass per 1000 seeds. By all hybrids, the mass of seeds in 100 l volume is greater in the Dobrich region. The test weight is highest in both regions by the Krasela hybrid.

4. It has been studied that in both regions the hybrid Deveda stands out with the highest content of linoleic acid, while the hybrid Sunny has the highest content of oleic acid. The crude protein content in the seeds is higher in the Plovdiv region. In both regions, the highest protein, lysine, methionine and cystine are accumulated by the standard P64LP170.

#### **CONCLUSION:**

Based on the various research methods learned and applied by the doctoral student, the correctly conducted experiments, the analyses and formulated recommendations and conclusions made, I consider that the presented dissertation meets the requirements of the Law for the Development of the Academic staff in the Republic of Bulgaria and the Regulations of the Agricultural University for its application, which gives me reason to evaluate it **POSITIVELY**.

I would like to propose to the members of the esteemed Scientific Jury also to vote positively and award Bozhidar Frantsov Tanchev, the educational and scientific degree "Doctor" in the scientific specialty "Crop Production".

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Plovdiv

